

CLAIMS

1. (Currently Amended) A method for facilitating detection of an object in a point cloud of three-dimensional imaging data representing an area of study where the object potentially is obscured by intervening obstacles, the method comprising:

collecting a point cloud of three-dimensional imaging data representing an area of study where an object potentially is obscured by intervening obstacles;

processing the imaging data to identify elements in the point cloud having substantially common attributes signifying that the identified elements correspond to a feature in the area of study that is at least partially obscured by the intervening obstacles;

generating at least one isosurface associating the elements having substantially common attributes; and

generating a reversed orientation visualization model from the imaging data for a region of interest, thereby exposing the feature.

2. (Original) The method of Claim 1, further comprising gathering the point cloud of three-dimensional imaging data of the area of study from an aerial position.

3. (Original) The method of Claim 2, wherein the three-dimensional imaging data of the scene is gathered using ladar.

1 4. (Original) The method of Claim 1, wherein imaging data is processed
2 using a population function computed on a sampling mesh by a Fast Binning
3 Method (FBM).

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5 5. (Original) The method of Claim 4, wherein the isosurface of the
6 population function is computed using a marching cubes method.

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8 6. (Original) The method of Claim 1, further comprising allowing an
9 operator to manually select a region of interest from the area of study for
10 generating the reversed orientation visualization model.

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12 7. (Original) The method of Claim 6, wherein a nonreversed orientation
13 visualization model is a top-down view of the region of interest and the reversed
14 orientation visualization model is an up from underground visualization of the
15 region of interest.

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17 8. (Previously Presented) The method of Claim 1, wherein the reversed
18 orientation visualization model exposes areas of total ground occlusion.
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1 9. (Currently Amended) A method for detecting a possible presence in an
2 area of study of a ground-level object ~~from an aerial position where an intervening~~
3 ~~obstacle impedes a line of sight between the aerial position and the ground-level~~
4 object, the method comprising:

5 gathering a point cloud of three-dimensional imaging data representing
6 the area of study from an aerial position where an intervening
7 obstacle impedes a line of sight between the aerial position and a
8 ground-level object;

9 processing the imaging data to identify elements in the point cloud
10 having substantially common attributes signifying that the identified
11 elements correspond to a feature in the area of study that is at least
12 partially obscured by the intervening obstacle;

13 generating at least one isosurface associating the elements having
14 substantially common attributes;

15 selecting a region of interest from the area of study; and

16 generating from the imaging data gathered from the aerial position an up
17 from underground oriented visualization model of the region of
18 interest exposing the feature in the area of study that is at least
19 partially obscured by the intervening obstacle in the line of sight
20 between the aerial position and the ground-level object.

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22 10. (Original) The method of Claim 9, wherein the three-dimensional
23 imaging data of the area of study is gathered using ladar.
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1 11. (Original) The method of Claim 9, wherein imaging data is processed
2 using a population function computed on a sampling mesh by a Fast Binning
3 Method (FBM).

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5 12. (Original) The method of Claim 11, wherein the isosurface of the
6 population function is computed using a marching cubes method.

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8 13. (Original) The method of Claim 9, further comprising allowing an
9 operator to manually select the region of interest from the area of study.

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11 14. (Original) The method of Claim 9, wherein the up from underground
12 oriented visualization model exposes areas of total ground occlusion.

1 15. (Currently Amended) A computer-readable medium having stored
2 thereon instructions for facilitating detection of an object ~~in a point cloud of three-~~
3 ~~dimensional imaging data representing an area of study where the object~~
4 ~~potentially is obscured by intervening obstacles~~, the computer-readable medium
5 comprising:

6 first computer program code means for receiving a point cloud of three-
7 dimensional imaging data representing an area of study where an
8 object potentially is obscured by intervening obstacles;

9 second computer program code means for processing the imaging data
10 to identify elements in the point cloud having substantially common
11 attributes signifying that the identified elements correspond to a
12 feature in the area of study that is at least partially obscured by the
13 intervening obstacles;

14 third ~~second~~ computer program code means for generating an least one
15 isosurface associating the elements having substantially common
16 attributes; and

17 fourth ~~third~~-computer program code means for generating a reversed
18 orientation visualization model from the imaging data for a region of
19 interest, thereby exposing the feature.

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21 16. (Currently Amended) The computer-readable medium of Claim 15,
22 further comprising fifth ~~fourth~~-computer program code means for gathering the
23 point cloud of three-dimensional imaging data of the area of study from an aerial
24 position.
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1 17. (Original) The computer-readable medium of Claim 16, wherein the
2 three-dimensional imaging data of the scene is gathered using lidar.

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4 18. (Original) The computer-readable medium of Claim 15, wherein imaging
5 data is processed using a population function computed on a sampling mesh by a
6 Fast Binning Method (FBM).

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8 19. (Original) The computer-readable medium of Claim 18, wherein the
9 isosurface of the population function is computed using a marching cubes method.

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11 20. (Currently Amended) The computer-readable medium of Claim 15,
12 further comprising sixth ~~fifth~~ computer program code means for allowing an
13 operator to manually select a region of interest from the area of study for
14 generating the reversed orientation visualization model.

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16 21. (Original) The computer-readable medium of Claim 20, wherein a non-
17 reversed orientation visualization model is a top-down view of the region of
18 interest and the reversed orientation visualization model is an up from
19 underground visualization of the region of interest.

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21 22. (Original) The computer-readable medium of Claim 21, wherein the
22 reversed orientation visualization model exposes areas of total ground occlusion.

1 23. (Currently Amended) A computer-readable medium having stored
2 thereon instructions for detecting a possible presence in an area of study of a
3 ground-level object ~~from an aerial position where an intervening obstacle impedes~~
4 ~~a line of sight between the aerial position and the ground level object~~, the
5 computer-readable medium comprising:

6 first computer program code means for gathering a point cloud of three-
7 dimensional imaging data of the representing the area of study from
8 an the aerial position where an intervening obstacle impedes a line of
9 sight between the aerial position and a ground-level object;

10 second computer program code means for processing the imaging data
11 to identify elements in the point cloud having substantially common
12 attributes signifying that the identified elements correspond to a
13 feature in the area of study that is at least partially obscured by the
14 intervening obstacle;

15 third computer program code means for generating at least one
16 isosurface associating the elements having substantially common
17 attributes;

18 fourth computer program code means for selecting a region of interest
19 from the area of study; and

20 fifth computer program code means for generating from the imaging
21 data gathered from the aerial position an up from underground
22 oriented visualization model of the region of interest exposing the
23 feature in the area of study that is at least partially obscured by the
24 intervening obstacle in the line of sight between the aerial position
25 and the ground-level object.

1 24. (Original) The computer-readable medium of Claim 23, wherein the
2 three-dimensional imaging data of the area of study is gathered using ladar.

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4 25. (Original) The computer-readable medium of Claim 23, wherein imaging
5 data is processed using a population function computed on a sampling mesh by a
6 Fast Binning Method (FBM).

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8 26. (Original) The computer-readable medium of Claim 23, wherein the
9 isosurface of the population function is computed using a marching cubes method.

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11 27. (Original) The computer-readable medium of Claim 23, further
12 comprising sixth computer program code means allowing an operator to manually
13 select the region of interest from the area of study.

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15 28. (Original) The computer-readable medium of Claim 23, wherein the up
16 from underground oriented visualization model exposes areas of total ground
17 occlusion.

1 29. (Currently Amended) A system for facilitating detection of an object in a
2 ~~point cloud of three-dimensional imaging data representing an area of study where~~
3 ~~the object potentially is obscured by intervening obstacles~~, the system comprising:

4 a data gathering apparatus configured to collect a point cloud of three-
5 dimensional imaging data representing an area of study where an
6 object potentially is obscured by intervening obstacles;

7 an image processor configured to process the imaging data to identify
8 elements in the point cloud having substantially common attributes
9 signifying that the identified elements correspond to a feature in the
10 area of study that is at least partially obscured by the intervening
11 obstacles;

12 an isosurface generator configured to generate an least one isosurface
13 associating the elements having substantially common attributes; and
14 a reversed orientation visualization model generator configured to
15 generate a reversed orientation visualization model from the imaging
16 data for a region of interest, thereby exposing the feature.

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18 30. (Original) The system of Claim 29, further comprising a data gathering
19 apparatus configured to gather the point cloud of three-dimensional imaging data
20 of the area of study from an aerial position.

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22 31. (Original) The system of Claim 30, wherein the data gathering apparatus
23 is a ladar apparatus.
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1 32. (Original) The system of Claim 29, wherein the image processor
2 processes the imaging data using a population function computed on a sampling
3 mesh by a Fast Binning Method (FBM).
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5 33. (Original) The system of Claim 32, wherein the isosurface generator is
6 configured to compute the isosurface using a marching cubes method.
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8 34. (Original) The system of Claim 29, further comprising a region of
9 interest selector configured to allow an operator to manually select a region of
10 interest.
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12 35. (Original) The system of Claim 34, wherein the non-reversed orientation
13 visualization model is a top-down view of the region of interest and the reversed
14 orientation visualization model is an up from underground visualization of the
15 region of interest.
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17 36. (Original) The system of Claim 35, wherein the reversed orientation
18 visualization model exposes areas of total ground occlusion.
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1 37. (Currently Amended) A system for detecting a possible presence in an
2 area of study of a ground-level object ~~from an aerial position where an intervening~~
3 ~~obstacle impedes a line of sight between the aerial position and the ground-level~~
4 ~~object~~, the system comprising:

5 a data gathering apparatus configured to gather the point cloud of three-
6 dimensional imaging data of the area of study from the aerial
7 position where an intervening obstacle impedes a line of sight
8 between the aerial position and a ground-level object;

9 an image processor configured to process the imaging data to identify
10 elements in the point cloud having substantially common attributes
11 signifying that the identified elements correspond to a feature in the
12 area of study that is at least partially obscured by the intervening
13 obstacle;

14 an isosurface generator configured to generate at least one isosurface
15 associating the elements having substantially common attributes;

16 a region of interest selector configured to allow an operator to select a
17 region of interest from the area of study; and

18 an up from underground oriented visualization model generator
19 configured to generate from the imaging data gathered from the
20 aerial position an up from underground visualization model for the
21 region of interest exposing the feature in the area of study that is at
22 least partially obscured by the intervening obstacle in the line of
23 sight between the aerial position and the ground-level object.
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1 38. (Original) The system of Claim 37, wherein the data gathering apparatus
2 is a ladar apparatus.

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4 39. (Original) The system of Claim 37, wherein the image processor
5 processes the imaging data using a population function computed on a sampling
6 mesh by a Fast Binning Method (FBM).

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8 40. (Original) The system of Claim 39, wherein the isosurface generator
9 is configured to compute the isosurface using a marching cubes method.

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11 41. (Original) The system of Claim 37, wherein the up from
12 underground visualization model exposes areas of total ground occlusion.